VIA FACSIMILE 703-872-9306

15-CT-5344
PATENT

Remarks

The Office Action mailed November 26, 2003 has been carefully reviewed and the following remarks are made in consequence thereof.

Claims 1-32 are now pending in this application. Claims 1, 2, 8, 14, 15, 16, 19, 22, and 28 have been amended. Claims 29-32 are newly added. No new matter has been added. Claims 1-7, 9, 11-13, 15-21, 23, and 25-27 stand rejected. Claims 8, 10, 14, 22, 24, and 28 are objected to. A few calculation sheet is submitted herewith for newly added Claims 29-32.

The rejection of Claims 1-5, 9, 11, 15-19, 23, and 25 under 35 U.S.C. § 102(e) as being anticipated by Taguchi et al. (U.S. Patent 5,974,108) is respectfully traversed.

Taguchi et al. describe an X-ray CT scanning apparatus having an X-ray source for irradiating a beam of X-ray to an object to be examined, a detecting means provided with at least two rows of detector elements for detecting the X-ray beam to have a real data, and a couch traveling means for traveling in an axial direction of the body of the object a couch on which the object is placed, and characterized by: irradiating the X-ray beam from the X-ray source which is being rotated and simultaneously, traveling the couch with the couch traveling means to scan the object in a helical direction, and selecting two data located on both sides of the target slicing location from groups of the real data and their opposite data sampled by the detecting means and producing a desired data at the target slicing location by interpolation between the two selected data (see column 4, line 61-column 5, line 9).

Claim 1 recites a method for imaging an object with a computed tomographic (CT) imaging system, including the steps of "helically scanning the object with a multi-slice CT imaging system to acquire attenuation measurements of the object, the measurements including more than two conjugate samples, wherein a difference between a view angle of one of the more than two conjugate samples and a view angle of any one of the remaining conjugate samples of

the more than two conjugate samples is $n\pi$, wherein n is an integer greater than zero; estimating at least one projection along a curved plane of reconstruction of the object using the attenuation measurements of the object, including the more than two conjugate samples; and filtering and backprojecting the attenuation measurements of the object, including the more than two conjugate samples, to reconstruct at least one image slice of the object."

Taguchi et al. does not describe or suggest a method for imaging an object with a computed tomographic (CT) imaging system, including the steps of helically scanning the object with a multi-slice CT imaging system to acquire attenuation measurements of the object, the measurements including more than two conjugate samples, where a difference between a view angle of one of the more than two conjugate samples and a view angle of any one of the remaining conjugate samples of the more than two conjugate samples is $n\pi$, where n is an integer greater than zero, estimating at least one projection along a curved plane of reconstruction of the object using the attenuation measurements of the object, including the more than two conjugate samples, and filtering and backprojecting the attenuation measurements of the object, including the more than two conjugate samples, to reconstruct at least one image slice of the object.

Moreover, Taguchi et al. does not describe or suggest estimating at least one projection along a curved plane of reconstruction of the object using the attenuation measurements of the object. Rather, Taguchi et al. describe producing a desired data at the target slicing location by interpolation between the two selected data. For at least the reasons set forth above, Claim 1 is submitted to be patentable over Taguchi et al.

Claims 2-5, 9, and 11 depend from independent Claim 1. When the recitations of 2-5, 9, and 11 are considered in combination with the recitations of Claim 1, Applicant submits that dependent Claims 2-5, 9, and 11 likewise are patentable over Taguchi et al.

Claim 15 recites a computed tomographic (CT) imaging system for imaging an object, the system including a radiation source and a multi-slice detector configured to acquire

attenuation measurements of an object between the radiation source and the multi-slice detector, the system configured to "helical scan the object to acquire attenuation measurements of the object, said measurements including more than two conjugate samples, wherein a difference between a view angle of one of the more than two conjugate samples and a view angle of any one of the remaining conjugate samples of the more than two conjugate samples is $n\pi$, wherein n is an integer greater than zero; estimate at least one projection along a curved plane of reconstruction of the object using the attenuation measurements of the object, including the more than two conjugate samples; and filter and backproject the attenuation measurements of the object, including the more than two conjugate samples, to reconstruct at least one image slice of the object."

Taguchi et al. does not describe or suggest a computed tomographic (CT) imaging system for imaging an object, the system including a radiation source and a multi-slice detector configured to acquire attenuation measurements of an object between the radiation source and the multi-slice detector, the system configured to helical scan the object to acquire attenuation measurements of the object, the measurements including more than two conjugate samples, where a difference between a view angle of one of the more than two conjugate samples and a view angle of any one of the remaining conjugate samples of the more than two conjugate samples is $n\pi$, where n is an integer greater than zero, estimate at least one projection along a curved plane of reconstruction of the object using the attenuation measurements of the object, including the more than two conjugate samples, and filter and backproject the attenuation measurements of the object, including the more than two conjugate samples, to reconstruct at least one image slice of the object.

Moreover, Taguchi et al. does not describe or suggest a system configured to estimate at least one projection along a curved plane of reconstruction of the object using the attenuation measurements of the object. Rather, Taguchi et al. describe producing a desired data at the target

slicing location by interpolation between the two selected data. For at least the reasons set forth above, Claim 15 is submitted to be patentable over Taguchi et al.

Claims 16-19, 23, and 25 depend from independent Claim 15. When the recitations of Claims 16-19, 23, and 25 are considered in combination with the recitations of Claim 15, Applicant submits that dependent Claims 16-19, 23, and 25 likewise are patentable over Taguchi et al.

For the reasons set forth above, Applicant respectfully requests that the Section 102 rejection of Claims 1-5, 9, 11, 15-19, 23, and 25 be withdrawn.

The rejection of Claims 6-7, 12-13, 20-21, and 26-27 under 35 U.S.C. § 103(a) as being unpatentable over Taguchi et al. in view of Berlad (U.S. Patent 5,513,120) is respectfully traversed.

Taguchi et al. is described above. Berlad describes providing an interpolated image where the texture of the image does not vary as a function of location (see column 2, lines 16-18). The interpolation is based on a particular type of interpolation known as "four-point interpolation", i.e., interpolation that uses the nearest neighbor grid points and the next nearest neighbor grid points that are in a line with a grid location point requiring interpolated data (see column 2, lines 18-24). The value by interpolation of an image point is obtained in a preferred embodiment using polonomial interpolation where a polonomial of the order N is passed through N+1 image points and is eventually used to compute the interpolated values (see column 4, lines 1-5). The most general polonomial interpolation is given by the Lagrange polynomial (see column 4, lines 5-6).

Claims 6-7 and 12-13 depend from Claim 1 which recites a method for imaging an object with a computed tomographic (CT) imaging system, including the steps of "helically scanning the object with a multi-slice CT imaging system to acquire attenuation measurements of the object, the measurements including more than two conjugate samples, wherein a difference

between a view angle of one of the more than two conjugate samples and a view angle of any one of the remaining conjugate samples of the more than two conjugate samples is $n\pi$, wherein n is an integer greater than zero; estimating at least one projection along a curved plane of reconstruction of the object using the attenuation measurements of the object, including the more than two conjugate samples; and filtering and backprojecting the attenuation measurements of the object, including the more than two conjugate samples, to reconstruct at least one image slice of the object."

Neither Taguchi et al. nor Berlad, considered alone or in combination, describe or suggest a method for imaging an object with a computed tomographic (CT) imaging system, including the steps of helically scanning the object with a multi-slice CT imaging system to acquire attenuation measurements of the object, the measurements including more than two conjugate samples, where a difference between a view angle of one of the more than two conjugate samples and a view angle of any one of the remaining conjugate samples of the more than two conjugate samples is $n\pi$, where n is an integer greater than zero, estimating at least one projection along a curved plane of reconstruction of the object using the attenuation measurements of the object, including the more than two conjugate samples, and filtering and backprojecting the attenuation measurements of the object, including the more than two conjugate samples, to reconstruct at least one image slice of the object.

Moreover, neither Taguchi et al. nor Berlad, considered alone or in combination, describe or suggest estimating at least one projection along a curved plane of reconstruction of the object using the attenuation measurements of the object. Rather, Taguchi et al. describe producing a desired data at the target slicing location by interpolation between the two selected data, and Berlad describes that the most general polonomial interpolation is given by the Lagrange polynomial. For at least the reasons set forth above, Claim 1 is submitted to be patentable over Taguchi et al. in view of Berlad.

Claims 6-7 and 12-13 depend from independent Claim 1. When the recitations of Claims 6-7 and 12-13 are considered in combination with the recitations of Claim 1, Applicant submits that dependent Claims 6-7 and 12-13 likewise are patentable over Taguchi et al. in view of Berlad.

Claims 20-21 and 26-27 depend from Claim 15, which recites a computed tomographic (CT) imaging system for imaging an object, the system including a radiation source and a multi-slice detector configured to acquire attenuation measurements of an object between the radiation source and the multi-slice detector, the system configured to "helical scan the object to acquire attenuation measurements of the object, said measurements including more than two conjugate samples, wherein a difference between a view angle of one of the more than two conjugate samples and a view angle of any one of the remaining conjugate samples of the more than two conjugate samples is $n\pi$, wherein n is an integer greater than zero; estimate at least one projection along a curved plane of reconstruction of the object using the attenuation measurements of the object, including the more than two conjugate samples; and filter and backproject the attenuation measurements of the object, including the more than two conjugate samples, to reconstruct at least one image slice of the object."

Neither Taguchi et al. nor Berlad, considered alone or in combination, describe or suggest a computed tomographic (CT) imaging system for imaging an object, the system including a radiation source and a multi-slice detector configured to acquire attenuation measurements of an object between the radiation source and the multi-slice detector, the system configured to helical scan the object to acquire attenuation measurements of the object, the measurements including more than two conjugate samples, where a difference between a view angle of one of the more than two conjugate samples and a view angle of any one of the remaining conjugate samples of the more than two conjugate samples is $n\pi$, where n is an integer greater than zero, estimate at least one projection along a curved plane of reconstruction of the object using the attenuation measurements of the object, including the more than two conjugate samples, and filter and

backproject the attenuation measurements of the object, including the more than two conjugate samples, to reconstruct at least one image slice of the object.

Moreover, neither Taguchi et al. nor Berlad, considered alone or in combination, describe or suggest a system configured to estimate at least one projection along a curved plane of reconstruction of the object using the attenuation measurements of the object. Rather, Taguchi et al. describe producing a desired data at the target slicing location by interpolation between the two selected data, and Berlad describes that the most general polonomial interpolation is given by the Lagrange polynomial. For at least the reasons set forth above, Claim 15 is submitted to be patentable over Taguchi et al. in view of Berlad.

Claims 20-21 and 26-27 depend from independent Claim 15. When the recitations of Claims 20-21 and 26-27 are considered in combination with the recitations of Claim 15, Applicant submits that dependent Claims 20-21 and 26-27 likewise are patentable over Taguchi et al. in view of Berlad.

For the reasons set forth above, Applicant respectfully requests that the rejection of Claims 6-7, 12-13, 20-21, and 26-27 under 35 U.S.C. 103(a) be withdrawn.

Claims 8, 10, 14, 22, 24, and 28 were indicated as being allowable if amended to incorporate the recitations of the base claim and any intervening claims. Claims 8, 10, 14, 22, 24, and 28 depend, directly or indirectly, from their respective independent Claims 1 and 15, which are submitted to be in condition for allowance. When the recitations of 8, 10, 14, 22, 24, and 28 are considered in combination with the recitations of their respective independent Claims 1 and 15, Applicant submits that dependent Claims 8, 10, 14, 22, 24, and 28 are also in condition for allowance.

Newly added Claims 29-30 depend from independent Claim 1, which is submitted to be in condition for allowance and patentable over the cited art. For at least the reasons set forth above, Applicant respectfully submits that Claims 29-30 is also patentable over the cited art.

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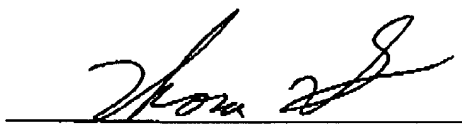
Newly added Claims 31-32 depend from independent Claim 15, which is submitted to be in condition for allowance and patentable over the cited art. For at least the reasons set forth above, Applicant respectfully submits that Claims 31-32 are also patentable over the cited art.

In view of the foregoing remarks, this application is believed to be in condition for allowance. Reconsideration and favorable action is respectfully solicited.

Respectfully Submitted,



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